

### REMARKS

Claims 1-6, 8-11, 19 and 20 are pending and at issue in the application with claims 1, 19 and 20 being the independent claims. Claim 20 has been added. Reconsideration and withdrawal of the rejections in view of the remarks below is respectfully requested.

The applicants respectfully traverse the rejection of claims 1, 2, 4, 10 and 11 as anticipated by Hamzehdoost et al. (U.S. Pat. No. 5,430,331), and the rejection of claim 19 as unpatentable over Hamzehdoost et al. The applicants further respectfully traverse the rejections of claims 3, 5, 6, 8, 9 and 11 as unpatentable over Hamzehdoost et al. in view of one or more of Majumdar et al. (U.S. Pat. 5,703,399), McCarthy et al. (U.S. Pat. 3,956,726) and Tomita et al. (U.S. Pat. No. 5,440,169).

Each of claims 1-6 and 8-11 recites a semiconductor power module that includes a heat sink comprising a compound of at least one of AlN and BeO. Claim 19 recites a semiconductor power module that includes a heat sink consisting of Al<sub>2</sub>O<sub>3</sub>. The heat sink of each of claims 1-6, 8-11 and 19 has a surface exposed to the outside of the semiconductor power module.

The applicants respectfully submit that claim 1 is not anticipated by Hamzehdoost et al., because Hamzehdoost et al. does not teach each and every element as set forth in claim 1. MPEP 2131 requires that a claim can only be anticipated if each and every element *as set forth in the claim* is found in a signal prior art reference. (*See Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). MPEP 2131 further requires that the elements must be arranged as required by the claim. (*See In Re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990)). The official action has not cited a reference that discloses each and every element arranged as required by claim 1, because Hamzehdoost et al. teaches a distinct difference between aluminum nitride and copper, namely that Hamzehdoost et al. only allows copper slugs to have an exposed surface and specifically teaches away from aluminum nitride substrates having an exposed surface.

In particular, Hamzehdoost et al. does not teach or suggest a heat sink comprising AlN and/or BeO which has a surface exposed to the outside of the power module. Instead,

Hamzehdoost et al. discloses that all thermally conductive substrates (130, 144) formed of AlN are entirely encased in plastic molding and are not exposed to the outside of the module. (Hamzehdoost et al., col. 6, lines 20-34; col. 7, lines 30-37 and lines 53-61; col. 9, lines 17-26; Figs. 6, 9A, 10, 14A). The only thermally conductive substrates (138, 146) disclosed by Hamzehdoost et al. which are exposed to the outside of the module are formed of *copper*, not aluminum nitride. (Hamzehdoost et al., col. 6, line 67 to col. 7, line 10; col. 7, lines 37-39; col. 9, lines 17-23; Figs. 8, 9B, 14B). As such, Hamzehdoost et al. does not disclose or suggest a heat sink formed of AlN and/or BeO which has a surface exposed to the outside of the power module, as recited by claim 1. Therefore, claim 1 cannot be anticipated or rendered obvious by Hamzehdoost et al., nor has the official action presented a *prima facie* case of anticipation or obviousness with respect to claim 1. Moreover, as claim 1 is allowable over the art of record, claims 2, 4 and 10 are allowable as being dependent on claim 1.

The applicants further respectfully submit that claim 19 is not obvious over Hamzehdoost et al. In particular, the official action does not establish a *prima facie* case of obviousness because Hamzehdoost et al. teaches away from the combination. As explained above, Hamzehdoost et al. specifically teaches away from exposing a surface of a thermally conductive substrate formed of aluminum nitride. Because Hamzehdoost et al. discloses that other ceramic-type substrate materials similar to aluminum nitride may be suitable (see col. 6, lines 23-26), the teachings of Hamzehdoost et al. with respect to aluminum nitride are also applicable to any similar materials suggested by Hamzehdoost et al. Accordingly, Hamzehdoost et al. teaches away from exposing a surface of a thermally conductive substrate which may be formed of materials similar to aluminum nitride. One of ordinary skill in the art would therefore not be motivated by Hamzehdoost et al. to provide a heat sink consisting of Al<sub>2</sub>O<sub>3</sub> which has a surface exposed to the outside of the semiconductor module, as recited by claim 1, because Hamzehdoost et al. teaches away from such a combination.

Further, as admitted in the official action, Hamzehdoost et al. does not disclose a heat sink consisting of Al<sub>2</sub>O<sub>3</sub> alone. The official action merely states that selection of a known material based on its suitability for its intended use may be used to support a *prima facie* case

of obviousness. In the "Amendment 'G' and Response of Final Official Action" of January 4, 2006, the applicants requested production of prior art disclosing the official action's assertion that the use of  $\text{Al}_2\text{O}_3$  as a heat sink material is an intended use within the knowledge generally available to one of ordinary skill in the art. *See* MPEP 2144.03. The official action has failed to produce any such prior art or otherwise demonstrated that the art recognizes the suitability of using  $\text{Al}_2\text{O}_3$  as a heat sink material. A *prima facie* case of obviousness cannot be established where all the limitations of a claimed combination are not taught or suggested by the prior art. *See In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). *See also* MPEP 2143.03.

Newly added claim 20 recites a semiconductor power module that includes a heat sink consisting of BeO. Hamzedoost et al. does not disclose a heat sink consisting of BeO alone. Although Hamzedoost et al. discloses a thermally conductive substrate (138, 146) formed of copper and exposed to the outside of the module, Hamzedoost et al. does not disclose a heat sink formed of BeO which is exposed to the outside of the module. Because Hamzedoost et al. does not disclose or suggest a heat sink formed of BeO with a surface exposed to the outside of the power module, new claim 20 is patentable over Hamzedoost et al.

Likewise, none of Majumdar et al., McCarthy et al. or Tomita et al. discloses or suggests a heat sink comprising AlN and/or BeO, or consisting of  $\text{Al}_2\text{O}_3$ , which has a surface exposed to the outside of the power module. Therefore, none of Majumdar et al., McCarthy et al. or Tomita et al., either alone or in combination with Hamzehdoost et al., renders any of claims 1-6, 8-11, 19 or 20 obvious.

Appl. No. 09/677,558  
Amdt. dated May 30, 2006  
Reply to final official action of February 28, 2006

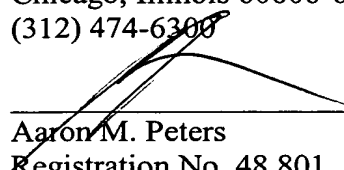
### CONCLUSION

Accordingly, the applicants respectfully submit that all pending claims are patentable over the art of record and should be allowed. In the light of the foregoing, prompt issuance of a notice of allowance is respectfully solicited. Should the examiner have any questions, she is respectfully invited to telephone the undersigned.

Respectfully submitted,

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